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## TOCOTREMA LINGUA (CREPLIN)

THE ADULT STAGE OF A SKIN PARASITE OF THE CUNNER AND OTHER  
FISHES OF THE WOODS HOLE REGION \*

EDWIN LINTON

Washington and Jefferson College, Washington, Pa.

In 1884 John A. Ryder published an account of a skin parasite of the cunner (*Tautoglabrus adspersus*). The diseased fish which furnished the material for Ryder's paper were from two localities, Woods Hole, Mass., and Cape Breton, N. S., and had attracted the attention of collectors on account of a peculiar spotted and rough appearance due to the presence of cysts in the skin. While Ryder did not determine the exact nature of the animal inhabiting these cysts he concluded that it was most probably a flat worm belonging to the Trematoda.

In 1889 I noted the occurrence of similar cysts in the skin of a cunner (Linton, 1890). The appearance of the infected fish agreed with Ryder's description, and each cyst opened contained an immature trematode. Again I recorded (1901) the finding of this parasite in the tautog (*Tautoga onitis*). Since that date I have found this parasite on a number of the species of fish of the Woods Hole region. They are of frequent occurrence on the winter flounder, tomcod and eel, less so on other fishes, while cunners and tautog are seldom wholly free from them.

It was not until July 24, 1911, that an adult trematode was recognized as the final stage of the skin parasite. On that date I obtained from the intestine of the loon (*Gavia imber*) a large number of small distomes, 4,789 by actual count. Another loon was examined on September 1 of the same year with similar results. It was at once noticed that these trematodes bore a close resemblance to the immature forms occurring in the skin cysts of the cunner and other fishes of the region. A re-examination of some cysts from the skin of fishes was at once made, and the young forms liberated from the cysts compared with adults and immature from the intestine of the loon. Details of this examination are given later in this paper. It is sufficient to state in this place that enough points of resemblance were made out to warrant the conclusion that the trematodes found in the intestine of the loon are the adult stage of some, at least, of the immature encysted forms found in the skin of various fishes.

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These small distomes from the loon appear to be identical with the species originally named *Distomum lingua* by Creplin, as that species is figured by Olsson, and the anatomy of the peculiar genital sucker agrees with that shown for this species in the excellent description and figures of Jaegerskiöld. Following is a description of the species based on my material.

*Tocotrema lingua* (Creplin) Looss.—Small, body depressed, margins, especially in the vicinity of the neck, with a tendency to fold ventrally; outline varying from linear to pyriform but mostly oval, tapering toward anterior end and bluntly rounded posteriorly; greatest breadth, in adults with eggs, at the level of the folds of the uterus, which is usually at about the posterior two-thirds of the length. The neck is from one-half to two-thirds of the entire length of the worm, depending on the state of contraction, and the outline varies accordingly. Young forms without ova may be nearly linear in outline or broader in front of the genital aperture than behind that structure. Very minute scale-like spines cover the anterior part of the body densely. These are plainly shown on the surface and margins in front of the genital aperture. Behind that point they are seen with difficulty. The acetabulum is minute, and forms an anterior, internal muscular portion of the genital sucker. The genital aperture is situated on the median line, from the middle of the length to the posterior two-thirds, according to the condition of contraction of the neck.

The oral sucker is subterminal and its aperture is circular. There is a very short prepharynx followed by the pharynx which is longer than broad, oval-elliptical, its length about equaling the diameter of the oral sucker. The slender esophagus is longer than the pharynx and may be more than twice as long. The forks of the intestine are slender, simple, and extend to the posterior end of the body.

Near the posterior end of the body are the two testes which are contiguous, diagonally placed, and, as seen in compressed specimens, distinctly lobed. In uncompressed individuals the lobes of the testes are often indistinct. The vas deferens is obscured by the folds of the uterus so that its course is difficult to trace. In a few specimens, which had a smaller number of ova than are found in most cases, a tubular seminal vesicle could be made out lying in a few loose folds dorsally behind the genital sucker. It terminates in an ejaculatory duct which lies in the dorsal portion of a short, papillary cirrus-like body (kegelförmiges körper of Jaegerskiöld) and empties into a genital sinus on the anterior margin of the cirrus-like body. The latter is surrounded by the muscles of the genital sucker. At the anterior margin of the right testis lies the relatively large seminal receptacle. In some cases this is nearly circular in outline; in others it is oval with the longer

diameter transverse. In sections it is seen to extend from the dorsal to the ventral wall of the body, but in the whole mounts it is perhaps more clearly seen in dorsal than in ventral view.

Along the anterior margin of the seminal receptacle is the ovary, which may be in part obscured by the folds of the uterus. When the worm is flattened and the ova are not too numerous the ovary is seen to be distinctly lobed. The ovary, seminal receptacle and testes therefore are massed together near the posterior end of the body. The folds

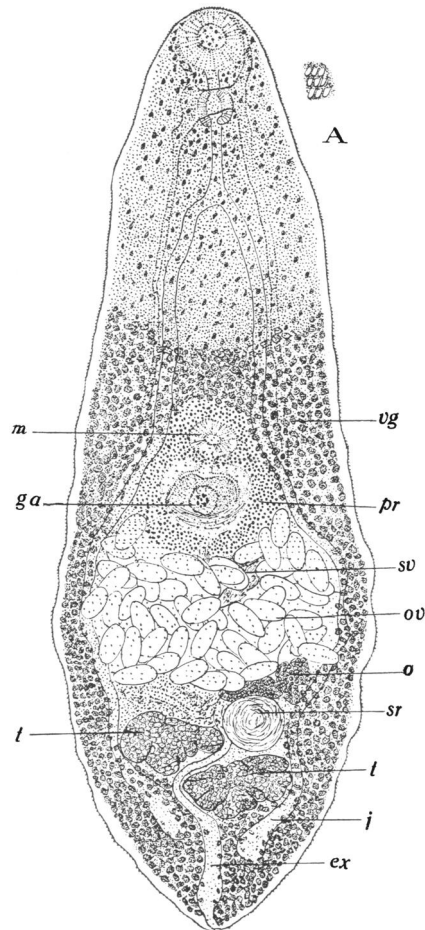


Fig. 1.—Adult specimen of *Tocotrema lingua* from Loon; dorsal view, in balsam. Length 0.84 mm. *a*, surface spines, 0.001 mm. long.

Abbreviations Used in Figures: *de*, ductus ejaculatorius; *ex*, excretory vessel; *ga*, genital aperture; *gp*, genital papilla; *gs*, genital sinus; *i*, intestine; *m*, ventral sucker; *o*, ovary; *ov*, ovum, ova in uterus; *pr*, prostate; *sr*, seminal receptacle; *sv*, seminal vesicle; *t*, testis; *v*, outlet of uterus; *vd*, vas deferens and seminal vesicle; *vg*, vitelline glands.

of the uterus are crowded between them and the genital aperture, the ova appearing as a golden yellow mass which extends nearly from margin to margin. The ova are oval-elliptical and, compared with the small size of the worm, are of good size. The terminal portion of the uterus opens into a cleft or sinus at a point adjacent to and dorsal to the opening of the ejaculatory duct. The genital sinus lies in front of the organ, called in the explanation of figures the genital papilla, (Figs. 4, 5, 6, *gp*), communicates anteriorly with the ventral sucker, and ventrally with the genital aperture. The genital sucker is surrounded

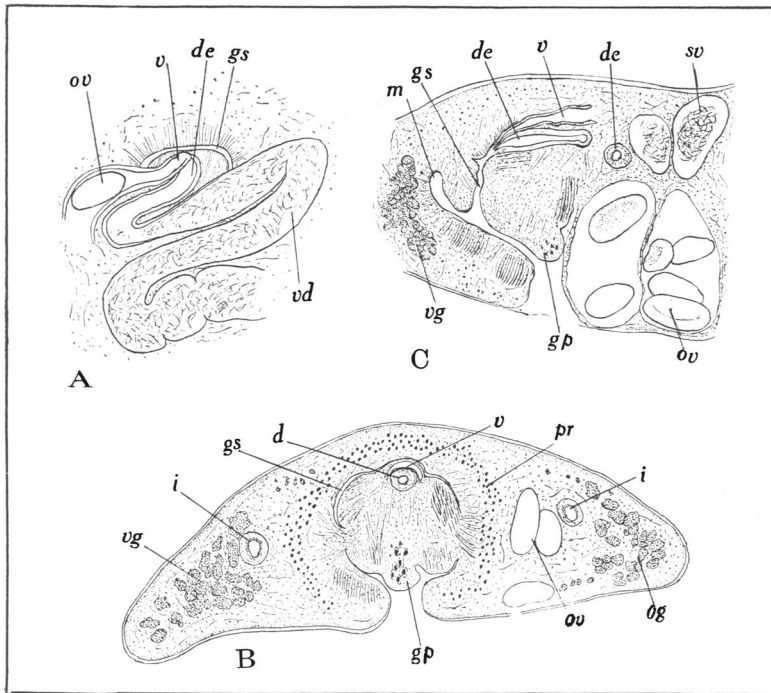


Fig. 2.—Sections thru dorsal portion of genital sucker; *A*, horizontal; *B*, transverse; *C*, sagittal.

by a somewhat triangular area of cells which are probably prostatic. The vitellaria are diffuse and fill the posterior and lateral margins of the body to a point in front of the genital aperture where they meet on the median line.

The excretory vessels were not completely made out. An excretory pore was distinguished situated dorsally at the posterior end of the body. From it a vessel was traced which passed between the testes. Transverse sections show a small lateral vessel on each side of the neck

region, but not distinctly enough to admit of satisfactory reconstruction.

A nerve mass lying dorsal to the pharynx, with short anterior branches, and lateral nerves traceable posteriorly to the anterior borders of the vitellaria are visible in many of the stained and mounted specimens.

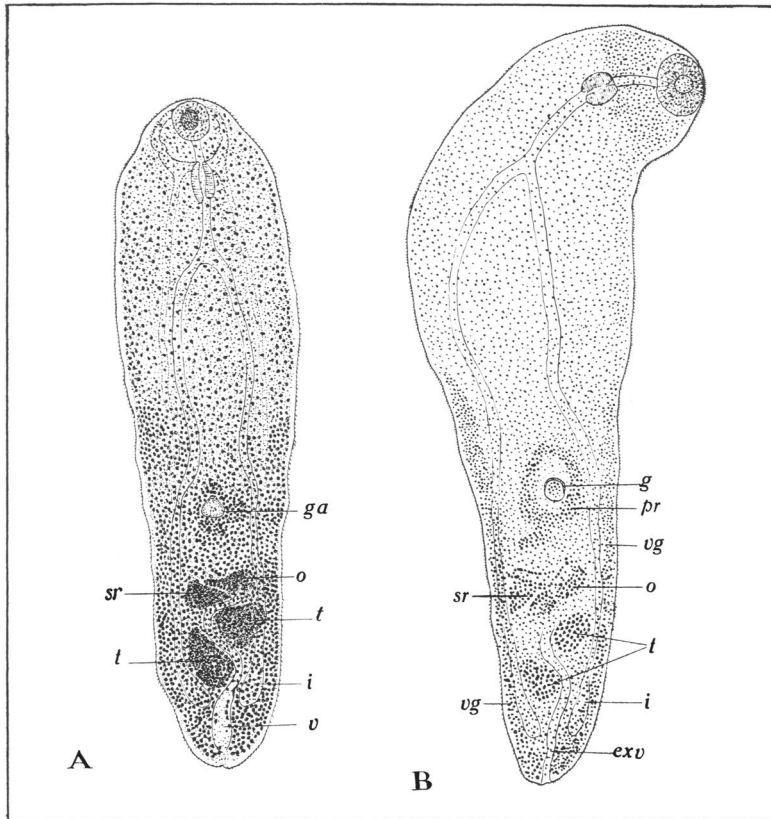


Fig. 3.—*A*. Young specimen from Loon; dorsal view, in balsam. Length 0.55 mm. *B*. Young distome from cyst in skin of cunner, in balsam. Length, 0.7 mm.

Dimensions of a living specimen in millimeters: Length 0.75; maximum breadth, 0.35; diameter of oral sucker, 0.07; ova, 0.04 by 0.02.

A specimen flattened under the cover-glass had the following dimensions: Length, 1.40; maximum breadth 0.70; diameter of oral sucker, 0.09; pharynx, length 0.04, breadth 0.03; ova, 0.047 by 0.023; genital sucker, 0.56 from the anterior end; bifurcation of the intestine

midway between anterior end and genital sucker. Following are lengths and breadths of ten specimens taken at random from a large number mounted in balsam:

Length,	0.70	0.97	0.76	0.80	0.55	0.80	0.76	0.67	0.72	0.64
Breadth	0.32	0.20	0.35	0.28	0.22	0.30	0.27	0.22	0.28	0.32

The above measurements were made of specimens from the loon. Following are dimensions of four specimens taken at random from a considerable number mounted in balsam, from the herring-gull:

Length	1.32	0.84	1.52	0.91
Breadth	0.40	0.33	0.48	0.33

Following is a record of the finds of *Tocotrema lingua* at Woods Hole. Some of these were made in 1904, but were not given special attention at the time of collecting.

*Colymbus auritus*: Feb. 8, 1912; 1.

*Gavia imber*: July 24, Sept. 1, 1911; very numerous on each date. Feb. 21, 1914, 2, immature.

*Larus argentatus*: Feb. 16, 17, 1912, numerous on each date. July 22, 1912, 252; Sept. 4, 1912, few. Jan. 22, 1914, 150; April 29, 1914, 1; Sept. 28, 1914, 1.

*Larus atricilla*: Aug. 12, 1904, 27 from one gull, 86 from another. Aug. 15, 1913, 18 from one gull, 6 from another.

*Nyctocorax nyctocorax*: July 15, 1913; few, immature.

*Sterna dougalli*: Aug. 3, 1904, 1; Aug. 12, 1904, 21.

*Sterna hirundo*: Aug. 5, 1904, 1.

The specimens recorded for January and February are from the material collected by Vinal N. Edwards.

Young trematodes (Fig. 3B) from cysts taken from the skin of cunners, tautog, and other species of fish, were compared with specimens of *Tocotrema lingua* from the loon and other fish-eating birds with the following results: The body in each case was covered with a dense coat of minute scale-like spines of similar appearance; oral sucker, prepharynx, esophagus and intestinal rami agree; rudiments of genital sucker, genital papilla, testes, ovary, sperm receptacle and vitellaria agree in relative positions to the finished structures in the adult. Furthermore nothing was seen in the one that contradicted any point in the other.

A few immature specimens were found among the adults in the final hosts (Fig. 3A). These agree very closely in form with those removed from cysts in that the neck is wider than the posterior third of the body. With the maturing of the testes and ovary and the accumulation of ova in the uterus the posterior third becomes normally wider than the neck.

## SUMMARY

Certain trematodes encysted in the skin of the fishes of the Woods Hole region are the young of an adult which lives in the intestine of the loon and other fish-eating birds.

The identification of these encysted distomes with *Tocotrema lingua* renders Stafford's name (*Dermocystis ctenolabri*) for these encysted forms inapplicable.

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